

CLAIMS

1. A method of producing hyaluronic acid comprising (1) a step of transforming a plant cell using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or
5 (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having an activity of synthesizing the hyaluronic acid, (2) a step of growing a transformant obtained by
10 transformation, and (3) a step of separating the hyaluronic acid produced by the transformant.
2. A method of producing hyaluronic acid comprising (1) a step of transforming a plant using an expression recombinant vector
15 comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having an activity of synthesizing the hyaluronic acid
20 (2) a step of growing a transformant obtained by transformation, and (3) a step of separating the hyaluronic acid produced by the transformant.
3. A method of making a transformed plant cell having an
25 ability of producing hyaluronic acid comprising a step of transforming a plant cell using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or
30 insertions in an amino acid sequence of the hyaluronic acid synthase and having an activity of synthesizing the hyaluronic acid
35 (4) a method of making a transformed plant having an ability of producing hyaluronic acid comprising a step of transforming a

plant using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in

5 an amino acid sequence of the hyaluronic acid synthase and having an activity of synthesizing the hyaluronic acid.

5. The method according to claim 4 wherein the expression recombinant vector is the expression recombinant vector

10 comprising (1) (i) the DNA encoding hyaluronic acid synthase or (ii) the DNA encoding the polypeptide having the amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in the amino acid sequence of the hyaluronic acid synthase and having the activity of synthesizing
15 the hyaluronic acid and (2) an organ-specific or tissue-specific promoter, and the resulting transformed plant is the transformed plant having the ability of producing the organ-specific or tissue-specific hyaluronic acid.

20 6. The method according any of claims 1 to 5 wherein the hyaluronic acid synthase is the hyaluronic acid synthase derived from a vertebrate or a microorganism.

25 7. The method according any of claims 1 to 5 wherein the hyaluronic acid synthase is the hyaluronic acid synthase derived from chlorella virus.

30 8. A transformed plant cell having an ability of producing hyaluronic acid, obtained by transforming a plant cell using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having an
35 activity of synthesizing the hyaluronic acid.

9. A transformed plant having an ability of producing hyaluronic acid or a progeny thereof or an organ thereof or a tissue thereof having the same nature as in the plant, obtained
5 by transforming a plant using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid
10 synthase and having an activity of synthesizing hyaluronic acid.
10. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to claim 9 wherein the plant is the plant
15 selected from the group consisting of angiosperm, gymnosperm, pteridophyte and bryophyte.
11. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to claim 9 wherein the organ is one or two or
20 more organs selected from a root, a stem, a rootstock, a leaf, a flower, a root truncation, a seed and a shoot apex.
12. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to claim 9 wherein the tissue is one or two or
25 more tissues selected from the group consisting of an epidermis, a phloem, a parenchyma, a xylem and a vascular bundle.
- 30 13. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to claim 9 wherein the expression recombinant vector is the expression recombinant vector comprising (1) (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more
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amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having an activity of synthesizing hyaluronic acid and (2) a organ-specific or tissue-specific promoter, and the resulting

5 transformed plant is the transformed plant having the ability of producing the organ-specific or tissue-specific hyaluronic acid.

14. A transformed plant cell which produces hyaluronic acid synthase, obtained by transforming a plant cell using an
10 expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having an
15 activity of synthesizing the hyaluronic acid.

15. A transformed plant which produces hyaluronic acid synthase or a progeny thereof or an organ thereof or a tissue thereof having the same nature as in the plant, obtained by transforming
20 a plant using an expression recombinant vector comprising (i) a DNA encoding hyaluronic acid synthase or (ii) a DNA encoding a polypeptide having an amino acid sequence having one or more amino acid deletions, substitutions, additions or insertions in an amino acid sequence of the hyaluronic acid synthase and having
25 an activity of synthesizing the hyaluronic acid.

16. The transformed plant cell according to claim 8 or 14 wherein the hyaluronic acid synthase is the hyaluronic acid synthase derived from a vertebrate or a microorganism.
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17. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to any of claims 9 to 13 wherein the hyaluronic acid synthase is the hyaluronic acid synthase derived from a
35 vertebrate or a microorganism.

18. The transformed plant cell according to claim 8 or 14 wherein the hyaluronic acid synthase is the hyaluronic acid synthase derived from chlorella virus.

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19. The transformed plant or the progeny thereof or the organ thereof or the tissue thereof having the same nature as in the plant according to any of claims 9 to 13 wherein the hyaluronic acid synthase is derived the hyaluronic acid synthase from
10 chlorella virus.

20. A hyaluronic acid produced by the transformed plant cell according to claim 8 or 14 or the transformed plant or the progeny thereof or the organ thereof or the tissue thereof having
15 the same nature as in the plant according to any of claims 9 to 13.